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PLANETARY PHENOMENA FOR NOVEMBER AND  
DECEMBER, 1894.

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BY PROFESSOR MALCOLM MCNEILL.  
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The following brief notes on the Sun, Moon and planets, have been prepared at the request of the Council, and are designed for the aid of those interested in astronomy and who do not have an almanac. In the descriptive paragraphs Pacific Standard time is given, unless the contrary is indicated.

NOVEMBER.

*Mercury* is an evening star at the beginning of the month, too near the Sun to be seen. It passes inferior conjunction, and transits across the Sun's disc, on the morning of November 10. The time of conjunction is  $10^{\text{h}}\ 34^{\text{m}}$  A. M. The transit is an interesting phenomenon to watch, but is not of much scientific value. The planet now becomes a morning star and moves rapidly out to west elongation, which it reaches on November 27. It then rises nearly an hour and three-quarters before the Sun, and will be easily visible for perhaps two weeks. On November 12 *Mercury*, *Venus* and *Uranus* are all close together, but all are too near the Sun to be seen.

*Venus* is a morning star quite close to the Sun. It rises less than an hour before on November 1. It rapidly approaches the Sun, and comes to inferior conjunction on the morning of November 30.

*Mars* is in excellent position for observation, as it is above the horizon nearly the entire night. It is in the constellation *Pisces*,

and retrogrades (moves westward) slowly until November 22, when it begins to move eastward. It goes back on a line somewhat to the north of the line on which it travelled westward. By the end of the month its distance from the Earth will be about 57,000,000 miles, forty per cent. greater than it was at opposition, and its light will be only about half as great.

*Jupiter* is also in good position for observation, being above the horizon most of the night. It is retrograding in the constellation *Gemini*, moving westward a little more than  $2^{\circ}$ . At the end of the month it is about the Moon's diameter north and east of the 3d magnitude star  $\mu$  *Geminorum*.

*Saturn* is a morning star, not in a very good position for observation. At the end of the month it rises at about 4<sup>h</sup> A. M.

*Uranus* comes to conjunction with the Sun on November 7, and is too near the Sun to be seen throughout the month.

*Neptune* is above the horizon most of the night. It is so faint (only 8th magnitude) that it cannot be seen without a telescope, and it cannot easily be found without the use of setting circles.

#### DECEMBER.

The Sun crosses the equator and winter begins December 21, 12<sup>h</sup> 9<sup>m</sup> P. M.

The Moon will pass over the *Pleiades* group, in the constellation *Taurus*, on the night of December 10, and from all parts of the United States a number of occultations may be noted. As the Moon is less than two days from full, most of the phenomena will be so near the bright limb as to be less effective than if they were observed near new Moon, but the phenomenon is well worth observing.

*Mercury* is a morning star. It rises about an hour and forty minutes before the Sun on December 1, and may easily be seen in the morning twilight. During the month it approaches the Sun, and by the end of the month has nearly reached superior conjunction.

*Venus*, having passed superior conjunction on November 30, is an evening star, but remains too near the Sun to be seen. At the end of December it sets about half an hour after the Sun.

*Mars* is still in good view until quite late at night. By the end of the month it sets at about 2<sup>h</sup> A. M. During the month it

moves through the eastern part of the constellation *Pisces* into *Aries* about  $7^{\circ}$  or  $8^{\circ}$  eastward, and at the end of the month its distance from the Earth is more than twice as great as it was at opposition, and its light less than one-fourth as great. Its distance from us will then be a little more than 80,000,000 miles, only a little less than the distance of the Earth from the Sun.

*Jupiter* is also in good position for observation, being above the horizon throughout nearly the whole night. It is in opposition on December 22. It is in the constellation *Gemini*, and during the month moves about  $4^{\circ}$  westward. Its great northern Declination makes this opposition an especially favorable one for observation, as it approaches the zenith within a few degrees at transit. The distance of the planet from us at this opposition is greater than it has been at the two or three preceding. At the opposition of 1892, which occurred soon after perihelion passage, the planet was nearer to us by about 18,000,000 miles than it will be at the opposition of this year. That, however, means a variation of only about five per cent. in distance and ten per cent. in light. Its Declination was then about  $17^{\circ}$  less, and its position, therefore, much less favorable.

*Saturn* is a morning star, and by the end of the month rises at about 2<sup>h</sup> A. M. It moves eastward a little over  $2^{\circ}$  in the eastern part of the constellation *Virgo*. The ratio of major to minor axis of the rings is about three to one.

*Uranus* is also a morning star, rising a little more than an hour later than *Saturn*. It moves about  $1^{\circ}$  eastward in the constellation *Libra*.

*Neptune* is in opposition with the Sun on December 6. It is above the horizon throughout most of the night, and is in the eastern part of the constellation *Taurus*.

#### EXPLANATION OF THE TABLES.

The phases of the Moon are given in Greenwich Mean time, which is 8 hours fast of Pacific Standard time. To find the corresponding Pacific Standard time, subtract 8 hours from that given in the table. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table

must be corrected by adding or subtracting the change per day, multiplied by the fraction whose numerator is the longitude from Greenwich, and whose denominator is 24. This correction is seldom much more than 1<sup>m</sup>. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time if the place is west of the standard meridian, and *subtracting* if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for Lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

#### PHASES OF THE MOON, G. M. T.

First Quarter,	November 5,	3 <sup>h</sup> 16 <sup>m</sup>	P. M.
Full Moon,	November 13,	7 49	A. M.
Last Quarter,	November 20,	2 8	A. M.
New Moon,	November 27,	8 54	A. M.

#### THE SUN.

1894.	R. A.	Declination.	Rises.	Transits.	Sets.
	H. M.	° '	H. M.	H. M.	H. M.
Nov. 1.	14 27	— 14 32	6 31 A.M.	11 44 A.M.	4 57 P.M.
11.	15 7	— 17 31	6 42	11 44	4 46
21.	15 48	— 20 0	6 55	11 46	4 37
Dec. 1.	16 31	— 21 52	7 4	11 49	4 34

#### MERCURY.

Nov. 1.	15 36	— 21 53	8 8 A.M.	12 53 P.M.	5 38 P.M.
11.	15 0	— 16 44	6 34	11 38 A.M.	4 42
21.	14 38	— 12 53	5 17	10 36	3 55
Dec. 1.	15 12	— 15 42	5 22	10 30	3 38

#### VENUS.

Nov. 1.	14 0	— 11 1	5 51 A.M.	11 17 A.M.	4 43 P.M.
11.	14 49	— 15 19	6 15	11 26	4 37
21.	15 39	— 18 58	6 40	11 37	4 34
Dec. 1.	16 32	— 21 45	7 5	11 50	4 35

*MARS.*

Nov. 1.	1 31	+ 7 59	4 15 P.M.	10 46 P.M.	5 17 A.M.
II.	1 23	+ 7 50	3 27	9 58	4 29
21.	1 19	+ 8 6	2 45	9 16	3 47
Dec. 1.	1 21	+ 8 45	2 5	8 38	3 11

*JUPITER.*

Nov. 1.	6 27	+ 22 59	8 18 P.M.	3 45 A.M.	11 12 A.M.
II.	6 25	+ 23 1	7 37	3 4	10 31
21.	6 22	+ 23 4	6 54	2 22	9 50
Dec. 1.	6 18	+ 23 7	6 10	1 38	9 6

*SATURN.*

Nov. 1.	13 53	- 9 9	5 37 A.M.	11 9 A.M.	4 41 P.M.
II.	13 57	- 9 33	5 04	10 35	4 6
21.	14 1	- 9 56	4 31	10 0	3 29
Dec. 1.	14 6	- 10 18	3 57	9 25	2 53

*URANUS.*

Nov. 1.	14 52	- 16 5	7 1 A.M.	12 8 P.M.	5 15 P.M.
II.	14 54	- 16 16	6 25	11 32	4 39
21.	14 56	- 16 27	5 49	10 55	4 1
Dec. 1.	14 59	- 16 37	5 12	10 18	3 24

*NEPTUNE.*

Nov. 1.	4 57	+ 21 8	6 57 P.M.	2 16 A.M.	9 35 A.M.
II.	4 56	+ 21 5	6 16	1 35	8 54
21.	4 55	+ 21 4	5 36	12 55	8 14
Dec. 1.	4 54	+ 21 2	4 56	12 14	7 32

PHASES OF THE MOON, G. M. T.

First Quarter, December 5, 12<sup>h</sup> 15<sup>m</sup> P. M.  
 Full Moon, December 12, 7 46 P. M.  
 Last Quarter, December 19, 11 16 A. M.  
 New Moon, December 27, 2 20 A. M.

THE SUN.

1894.	R. A. H. M.	Declination. ° '	Rises. H. M.	Transits. H. M.	Sets. H. M.
Dec. 1.	16 31	- 21 51	7 4 A.M.	11 49 A.M.	4 34 P.M.
II.	17 14	- 23 2	7 14	11 54	4 34
21.	17 59	- 23 27	7 20	11 58	4 36
31.	18 43	- 23 5	7 24	12 3 P.M.	4 42

*Publications of the**MERCURY.*

Dec. I.	15 12	— 15 42	5 22 A.M.	10 30 A.M.	3 38 P.M.
II.	16 7	— 19 59	5 55	10 46	3 37
2I.	17 11	— 23 16	6 31	11 10	3 49
3I.	18 18	— 24 42	7 6	11 39	4 12

*VENUS.*

Dec. I.	16 32	— 21 45	7 5 A.M.	11 50 A.M.	4 35 P.M.
II.	17 26	— 23 28	7 27	12 5 P.M.	4 43
2I.	18 21	— 24 0	7 44	12 20	4 56
3I.	19 15	— 23 18	7 57	12 36	5 15

*MARS.*

Dec. I.	1 21	+ 8 45	2 5 P.M.	8 38 P.M.	3 11 A.M.
II.	1 27	+ 9 45	1 28	8 5	2 42
2I.	1 37	+ 11 1	12 54	7 36	2 18
3I.	1 50	+ 12 29	12 22	7 10	1 58

*JUPITER.*

Dec. I.	6 18	+ 23 7	6 10 P.M.	1 38 A.M.	9 6 A.M.
II.	6 12	+ 23 10	5 26	12 54	8 20
2I.	6 6	+ 23 13	4 40	12 8	7 36
3I.	6 1	+ 23 15	3 51	11 19 P.M.	6 47

*SATURN.*

Dec. I.	14 6	— 10 18	3 57 A.M.	9 25 A.M.	2 53 P.M.
II.	14 9	— 10 37	3 21	8 49	2 17
2I.	14 13	— 10 54	2 47	8 13	1 39
3I.	14 16	— 11 8	2 12	7 37	1 2

*URANUS.*

Dec. I.	14 59	— 16 37	5 12 A.M.	10 18 A.M.	3 24 P.M.
II.	15 1	— 16 47	4 35	9 41	2 47
2I.	15 3	— 16 56	3 58	9 3	2 8
3I.	15 5	— 17 4	3 22	8 26	1 30

*NEPTUNE.*

Dec. I.	4 54	+ 21 2	4 56 P.M.	12 14 A.M.	7 32 A.M.
II.	4 52	+ 21 0	4 12	11 30 P.M.	6 48
2I.	4 51	+ 20 59	3 31	10 49	6 7
3I.	4 50	+ 20 57	2 41	10 9	5 27